Modifying adoption research for mobile Internet service adoption: Cross-disciplinary interactions

Per E. Pedersen
Agder University College
per.pedersen@hia.no

Rich Ling
Telenor R&D
richard-seyler.ling@telenor.com

Abstract

One often meets the argument that the adoption of mobile Internet services is difficult to understand due to a lack of relevant research. However, much research has already been conducted on the adoption of basic mobile and traditional Internet services that are likely to converge into the services provided by the mobile Internet. In this article, we try to categorize four research directions relevant in understanding mobile Internet service adoption. We argue that because mobile Internet services are new, a lack of studies directly investigating the adoption these services is to be expected. However, we also argue that existing research directions provide valuable points of departure for further investigating and understanding the adoption of mobile Internet services. In particular, we suggest a cross disciplinary integration of the findings of four different research directions may improve our understanding of the basic mechanisms of individuals' adoption of mobile Internet services. In this article, we exemplify such an integration by suggesting how traditional adoption models in information systems research, such as the technology acceptance model or the theory of planned behavior, may be modified and extended when applied to study the adoption of mobile Internet services.

1. Introduction

One often meets the argument that due to the complexity of the service model and the convergence of technologies and services expected in mobile Internet services, it is very little relevant research available to help us understand the adoption of these services [2]. However, social scientists, industry researchers and mobile informatics researchers have studied the use of traditional mobile network services like voice and messaging for the past decades. Much of this research is highly relevant to understanding the adoption of more complex end-user services, but new issues are also raised when the services get more complex and are being used across channels. Because researchers of such diverse areas have been involved in this research, it is hard to find any reviews on adoption covering the whole research area. This article intends to categorize the research directions on end-users' behavior when *adopting* traditional and mobile network services likely to converge into mobile Internet services. The categorization may be useful to for example mobile informatics researchers, telecommunication sociologists and traditional information systems researchers moving from their traditional area of research into the area of mobile Internet services.

In studies of information and communication technology (ICT) adoption, different concepts, such as diffusion, adoption, appropriation and domestication are used. While these concepts are sometimes used to distinguish research on adoption in one direction from another, we propose that these concepts have much in common. Also, researchers studying adoption share a common interest in understanding how information technologies and services are being adopted by end users of different kinds and in different contexts. In this article we categorize four research directions of relevance to understanding the adoption of mobile Internet services. The four directions are termed diffusion research, adoption research, uses and gratifications research and domestication research. *Diffusion research* has its foundation in marketing and economics, and studies the aggregate diffusion or adoption of a technology or service in an industry, a community, or in society in general. *Adoption research* has its foundation in information systems research, and studies the adoption and use of traditional ICT in general and their use in organizations in particular. *Uses and gratifications research* has its foundation in media and communication theory, and studies the gratifications sought by adopters of different

kinds of media. *Domestication research* has its foundation in sociology and studies the adoption, use and domestication of technology in society with a particular focus on the societal consequences of technology domestication. In figure 1, what is focused in the adoption process and the levels of analysis of each of these research direction have been briefly illustrated.

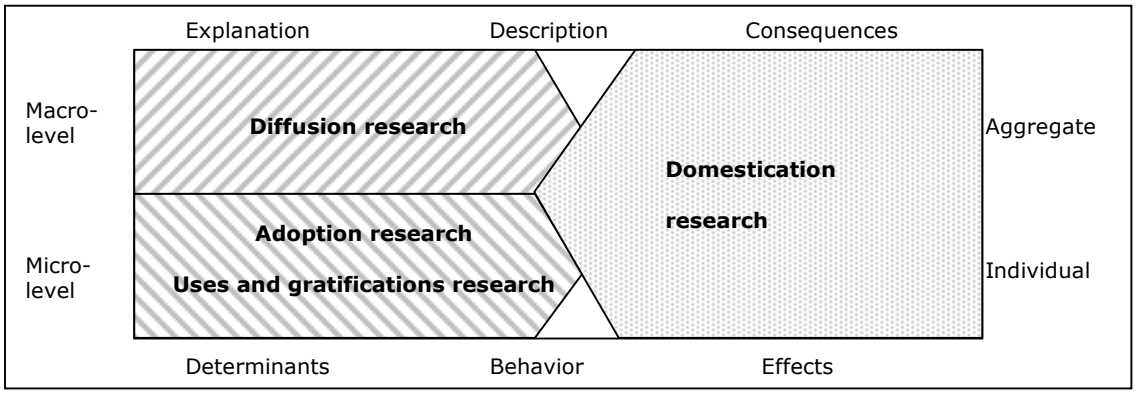

Figure 1. Research directions in mobile service adoption studies

From figure 1, we find that the research directions are quite different in level of analysis and in focus on the adoption process. For example, while diffusion research studies adoption at the aggregate level, adoption research studies adoption at the individual level, and while adoption research focuses the description and explanation of adoption, domestication research is more concerned with the individual and societal consequences of adoption. To provide a more detailed presentation of the research directions, the basic discipline, object of adoption, level of analysis, focus on the adoption process, and traditionally investigated context of each research direction are presented below. In addition, examples of studies in each research direction of relevance to understanding the adoption of mobile Internet services are briefly introduced. Finally, we suggest that integrating findings across research directions may be useful when trying to explain the adoption of mobile services, and show how traditional adoption models may be modified and extended when the taking findings of diffusion, uses and gratification and domestication research into consideration.

2. Diffusion research

Even though Rogers [42, p.42] lists ten *reference disciplines* of diffusion research, the main reference disciplines when applied to the diffusion of ICT are communication research, marketing and economics. As indicated by the title of Rogers' [42] book, the innovations being adopted are the *adoption objects* of study in diffusion research. Diffusion theory is meant to be general and includes the study of such diverse innovations as agricultural ideas as well as coffee [42, p. 42]. Thus, particular attention to the specific attributes of the ICT artifact is not very common in diffusion research [37].

The classic diffusion study typically contrasts different user categories to describe the adoption process of an innovation a posteriori. Several aggregate mechanisms are proposed to explain the observed diffusion process. In marketing, the Bass model focuses on how information is communicated in media and interpersonally, and how the two mechanisms of communication result in an S-shaped aggregate adoption rate often observed in studies of innovation diffusion [31]. Consequently, the *level of analysis* in diffusion research is aggregates of individual users, typically identified as user segments or as other aggregate communities of users.

As illustrated in figure 1, diffusion research mainly focuses on describing and explaining the adoption process as a process of innovation diffusion at the aggregate level. Studies focusing on *description* typically characterize user segments along the diffusion process, such as early adopters, early majority users and laggards, using demographic and socioeconomic variables. For example, Wei [52] studied the socioeconomic characteristics of mobile phone laggards in Hong Kong, Tjøstheim and Boge [49] studied the demographic characteristics of early adopters of mobile commerce when compared to non-adopters, while Mante-Meijer and Haddon [33] did the same for general mobile services like voice and messaging. In these studies, few attempts are made to explain the observed segment differences. When seeking *explanations*, two approaches are typically found. Rogers [42] suggests explanations of the observed diffusion process may be sought in attributes of the innovations being adopted. He suggested relative advantage, compatibility, complexity, trialability and

observability are the most important attributes of a technology explaining why it is being adopted [42, p. 250-251]. These are all supply side attributes presumed to influence usefulness and ease of use.

Rogers also suggested interactions of innovation attributes and characteristics of the network being used to communicate the innovation may be relevant when explaining the adoption process [42, p. 332-333]. For example, Mahler and Rogers [32] suggested that the difference in the adoption processes of mobile and fixed telephony may be explained by differences in network effects (externalities) between the two technologies. However, explanations of the observed diffusion process are most often sought in aggregate attributes of the innovation, market or individuals adopting it. Typically, attributes such as relative advantage, regulatory regime or price sensitivity are used in aggregate models of the diffusion process. For example, Gruber and Verboven [11] suggest that the regulatory regime provided by license regulation and competition explains the widespread diffusion of 2G mobile telephony in Europe. These aggregate studies of diffusion processes are of little help in developing individual level models of service adoption, but are typically applied to predict the aggregate adoption rates of new technologies mainly as a function of time only [17]. However, descriptive or explanatory diffusion studies based upon innovation attributes or network characteristics provides valuable insight into the determinants of the perceived concepts of traditional adoption models such as usefulness and ease of use.

The diversity of innovations studied and the aggregate level of analysis applied in diffusion research make it pay no particular attention to the *context* of technology adoption and use.

3. Adoption research

Adoption research is part of the area of information systems research and includes researchers of such diverse *disciplines* as organization science, informatics and information science. In information systems research (IS-research), two research directions have provided valuable findings on the adoption and use of services likely to converge into mobile Internet services; traditional adoption research and research on computer mediated communication (CMC-research). While adoption research has been focused on the adoption process of a wide variety of technologies and applications, CMC-research has focused primarily on mediated communication technologies, such as email and video conferencing systems [47]. In particular, CMC-research on media choice and use are relevant in understanding the adoption of mobile Internet services and are treated here as part of adoption research.

In adoption studies, the technologies being adopted are most often applications, systems or services rather than technological artifacts or devices. Examples of such *objects of adoption* are business software applications, email systems and personal productivity applications. As for diffusion research, however, adoption research has been criticized for a lack of attention to the attributes of the applications and services being adopted [37].

Adoption research typically studies users' decision to adopt a particular technology or service or their individual choice of media and pattern of media use at the individual *level of analysis*. However, adoption research goes beyond pure description of the adoption process, and seeks explanations of why a particular adoption behavior may be observed at the individual level. Three general categories of *explanatory variables* have been investigated in adoption research. Rationalistic or utilitarian explanations have been provided for example using variables such as usefulness and ease of use in the technology acceptance model [4], or interactivity and channel richness in media richness theory [3]. Social influence and symbolic interaction explanations add elements of how social mechanisms influence individuals' adoption of a particular technology or service in social contexts, for example through subjective norms [6] or perceived social influence [53]. Individuals' personal characteristics and situational factors, such as behavioral control [47], skills and recipient attributes [51] represent constraints on individuals' opportunity to act upon beliefs or norms, and represent the third category of variables often introduced in adoption research models. While the mobile and Internet services likely to converge into mobile Internet services have not been widely studied in adoption research, some recent examples of relevant research may be worth mentioning. For example, several CMC-researchers have now started to investigate the use of more informal messaging services in organizational settings [12, 34]. These studies indicate that informal messaging services are used for other purposes and message types than traditional services. For example, Nardi et al. [34] found that instant messaging was used to monitor awareness and negotiate other media in communication. Te'eni [48] suggests the higher degree of interactivity of these services may partly compensate for low channel capacity and make these services suitable for affective communication. In addition, adoption researchers have started applying traditional adoption models to explain the adoption of telecommunication-oriented services like telework [13], mobile telephones [18] and mobile commerce services [39]. So far, these studies indicate that the traditional technology

acceptance model [4] needs modifications in underlying assumptions of usefulness when explaining the adoption of mobile services. They also indicate that social influence and behavioral control variables needs to be added to the technology acceptance model supporting the more complex theory of planned behavior in explanations of mobile service adoption. So far, no particular attention has been given to typical attributes of mobile services such as availability and flexibility in these studies.

With a few exceptions only, adoption research has focused the adoption of ICT in organizational *contexts*. However, as the boundary between work and leisure contexts are likely to be even more blurred, and as new categories of users enter the work place, the understanding of technologies traditionally used in everyday and leisure contexts is likely to be more important [9, 34].

4. Uses and gratifications research

Uses and gratifications research has its foundation in communication research, an integrated field of researchers from several *disciplines* such as media, sociology and social psychology originally focusing on mass media and mass communications.

The *objects of adoption* being studied in uses and gratifications research were originally mass communication media. Later, uses and gratifications studies have been extended to study the gratifications of such diverse technologies and services as video games, Internet, email and household telephones, just to mention a few examples.

Uses and gratifications research focuses the individual user or adopter as the *level of analysis*. The general idea in uses and gratifications research is that adopters seek gratifications in technology use based upon their individual" needs" or "motivations" [23]. Thus, it has a theoretical foundation similar to utilitarian explanations of media use in CMC-research and traditional adoption research. However, the difference between these traditions and uses and gratifications research is that uses and gratifications studies start with an exploratory phase where the researcher does not hypothesize which particular gratifications are sought by a particular technology. Instead, the individual subjects are either studied in a qualitative setting to explore possible gratifications, or a list of possible gratification assumed to be common for all media is presented to and rated by the subjects. These gratifications are mostly based upon early uses and gratifications studies [23]. Some uses and gratifications studies also investigate the relationship between identified gratifications and usage measures, and thus extend this research from a *description* of gratifications to tests of the *explanatory* power of these gratifications. Generally, uses and gratifications research has been criticized for its lack of theoretical foundation [23] and low explanatory power [19].

Several uses and gratifications studies are found of technologies likely to be relevant to the mobile Internet, such as mobile phones [21], pagers [22], instant messaging services [20] and text messaging [15]. One may expect other gratifications to be sought from mobile voice services than traditionally sought from fixed telephony. Dimmick and Sikan [5] identified three general gratifications; "sociability", "instrumentality" and "reassurance" of fixed telephony before the widespread adoption of mobile phones. Leung and Wei [21] suggested that newer generations of mobile telephony introduce the telephone as a content medium as well as a communication medium. In their study of mobile phone users [21], seven gratifications were identified; "fashion/status", affection/sociability", "relaxation", "mobility", "immediate access", "instrumentality" and "reassurance". Thus, the traditional telephony gratifications were found, but in addition, gratifications related to fashion, relaxation and entertainment, flexibility and mobility were identified. In Leung and Wei [22], the general gratifications from pager use were identified as; "sociability", "information seeking", "entertainment", "utility" and "fashion/ status". Thus, the gratifications of pager use were very similar to what was sought from mobile phones, but "fashion and status" was found to be particularly important in pager use. Höflich and Rössler [15] conducted the only uses and gratifications study focusing particularly on text messaging that we have been able to identify. They identified the following gratifications; "reassurance" (rückversicherung), "sociability" (kontaktpflege), "immediate access/ availability" (verfügbarkeit), "instrumentality" (lebenshilfe) and "entertainment/ enjoyment" (nutz-spaz). One of the main findings of uses and gratifications research is that gratifications of mobile services go beyond those sought by traditional telephony and by traditional messaging services like email. Unique gratifications are those of "availability", "enjoyment" and "status" or "expressiveness".

Common to most uses and gratifications studies is that they focus the gratifications of technology in the *context* of everyday life, and often young users are studied because they often represent early adopters of the technologies studied.

5. Domestication research

Domestication research is dominated by social science researchers and its reference *disciplines* are sociology,

anthropology and ethnology. Domestication studies most often apply qualitative methodology. The main focus of domestication research is on the societal consequences of the domestication of technology; that is the process in which the use of technology becomes integrated into our everyday life. When quantitative methodologies are applied, domestication research is often more descriptive and categorizes adopters by demographic variables such as age and gender.

Domestication research has a long tradition of studying everyday life technology as the *object being adopted*. Examples of technologies studied are fixed telephony, television and home computers. Domestication studies are not limited to studies *of individuals or aggregates*, but are found describing the adoption and usage patterns of groups in society [50] as well as individual end-users [28]. In investigations of the societal consequences of adoption and use, both aggregate and individual level studies are found. For example, Townsend [50] analyzed the consequences of mobile telephony for the planning of cities, while Fortunati [8] analyzed the consequences for the family as an institution.

Domestication research often *describes* the domestication process as a five stage process consisting of imagination, appropriation, objectification, incorporation and conversion [43]. The first two stages of this process represent stages normally characterized by the term adoption in other research directions, but understanding the process of objectification and conversion is also important for example when studying the adoption of generations of technologies or clusters of complementary technologies [42]. The five stage domestication process also represents much of the explanatory power in domestication research when *explaining* adoption. However, the bases for explaining the *consequences* of technology domestication are more varied and are based on a variety of sociological, ethnological and social psychological theory. Of the domestication studies focusing upon the adoption, use and domestication of mobile services, important findings may be categorized by the *contexts* of technology and service use. For example domestication research has studied differences in adoption and use of mobile services in work and leisure contexts, in different contexts represented by demographic variables such as age (young versus other users) and gender (female versus male users), in contexts of private and public use, and in the dynamic contexts represented by multiple and changing roles of modern technology users [55, 10].

In the work context, much previous domestication research has been conducted on the adoption of mobile services among knowledge workers [35], but recent work has also focused "blue collar" workers [1]. Even though much of this research is interesting because it focuses on functional reasons for adoption, little of it has been directed specifically at the adoption decision of end-users. Instead, most of the research on mobile work is usability studies applied to design user interfaces and to develop work-related support applications. Research focusing the leisure context has either focused directly on the functional use of mobile services in leisure and everyday contexts, or focused on how the boundary between work and leisure contexts is blurred by the use of such services. For example, Palen et al. [38] studied the impact of mobile phones adopted for functional, work related reasons, on the users' everyday life activities. Palen et al. [38] found that the domestication process goes quickly. Users change their attitude toward the disturbing influence of the device and they are quick to find ways that the device fits into their daily lives. Examples of research on the blurring of boundaries between work and leisure life caused by adoption of mobile end-user services are studies of homework and studies of quality of life issues. Among other things, this work examines how some members of the family enjoy increased quality of life while others experience the opposite from family members' mobile service use. Thus, the adoption of mobile services is influenced by and influences the social networks of the adopters across work and leisure contexts.

When contrasting the contexts of diverse demographic groups, the "*introduction of mobile phones into existing situations illuminates various aspects of the context*" [24 p. 134]. Several studies focus on gender differences in mobile end-user service adoption. An early study of in this tradition was conducted by Rakow and Navarro [41]. Their work described interesting communication patterns, such as e.g. "remote mothering" among women. Rakow and Navarro asserted that, at an early point in the diffusion of the device, the mobile telephone was a device that replicated preexisting gender patterns, i.e. the role of the woman as an accessible nurturer and a person in need of male protection. Later, several studies have elaborated on gender differences in the adoption of both voice and other mobile services [24, 26]. The mobile telephone was earlier seen as a technical gizmo and thus a part of the male domain. As the adoption process has continued, and indeed teen girls adopt mobile telephones in significantly higher numbers than their same-aged male counterparts [26], the device has been redefined as a social network device and thus within the domain of women.

The differences in adoption patterns between *young people* (teens, adolescents) and other users have been one of the most studied issues in domestication research on mobile services. An important finding from *descriptive* studies is that from age 20, adoption is a linearly

decreasing function of age [33]. However, when compared to Internet adoption, the older people have a much higher adoption rate of mobile phones than of Internet. Still, their use of services is very simple, focusing almost exclusively on voice. The teenage segment has been described in several studies, both qualitative and quantitative. A summary of qualitative observations is found in Plant [40]. Among the most penetrating studies are a set of qualitative studies done by Rautiainen and Oksman on Finnish adolescents [36], by Weilenmann on Swedish teenagers [54] and by Ling and others on Norwegian teenagers [24, 30]. In these studies, service adoption and usage varies in segments of teenagers in a way that treating the teenager group as a homogeneous segment is not advisable. In quantitative studies, mobile phones are shown to have an adoption rate of close to 100 percent in teenage segments. Thus, the use of mobile services is very well integrated in the daily lives of teenagers. However, the impression that services are adopted for non-functional and social status reasons only [44], is contradicted by many of the descriptive studies. For example, Karlsen et al. [16] found a remarkable orientation towards usability and costs in their study of the potential adoption of mobile Internet services among Norwegian teenagers.

A variety of *explanations* has been suggested of the widespread adoption of mobile services among young users. For example, it has been suggested that the adoption behavior can be explained by a "theory of fashion" [25] wherein the popular characterization of the device seems to have changed with time, by the use of services as "ritual gift giving" [45], by treating the mobile phone as "symbolic capital" [44], or as an instrument in "family differentiation and symbol of individuality" [46], and by the use of services as a "group marker or social identifier" [54] or as a "self identifier" [14]. Currently, these explanations should all be treated as tentative because none of them has undergone formal hypothesis development and confirmatory testing. However, they suggest important explanations that when validated will have to be integrated as parts of a more formal theory of adoption.

For some time, domestication researchers have studied - and expressed opinions on - how society is affected by technology that brings the public into the private sphere. This question was first raised by researchers studying the domestication of fixed telephony. However, researchers studying the adoption of mobile end-user services now investigate how society is affected by the fact that an instrument for managing personal relations and networks - the mobile phone - can be used ubiquitously. Answers to this question may be given both at the micro level by studying individuals' use of mobile services in public places such as restaurants [28], or at the macro level by studying more fundamental changes in society. For example, Fortunati [7, 8] has investigated how the use of the mobile phone increases individuality, reduces the importance of the family institution, and has "*stolen communicative space from the public sphere and attributed it to the private*" [8, p.2]. As mentioned above, Townsend [50] has studied how mobile phones emphasize real time planning and "microcoordination" [29, 30]. These, in turn may change city planning and the everyday life in cities. All these studies focus the blurring of the boundaries between private and public spaces. Even though these studies are important to understand the consequences of widespread adoption of mobile services, their contribution to explaining individual user adoption is more limited.

The most recent trend in domestication research on mobile service adoption treats *contexts as dynamic* and end-users as *"negotiating and managing their numerous identities and relationships"* in a "role-to-role" society [10, 55]. Applying this perspective, Palen et al. [38] found that the "*mobility of ones profession"*, the "*number of roles one assumes professionally and personally"* and the "*degree of integration one has across those roles"* influences mobile service adoption [38, p.116]. This issue of role management has been given little attention in previous research on ICT-adoption, but should somehow also be integrated into a comprehensive model of mobile Internet service adoption.

6. Modifying adoption research for mobile Internet service adoption

Even though traditional Internet services and mobile services are expected to converge into mobile Internet services, few attempts have been made to apply traditional adoption models in IS-research to explain their potential adoption. We suggest that applying these adoption models to mobile Internet services may improve our understanding of individual users' adoption process and make us move from description of this process into explaining it. However, findings in diffusion, uses and gratifications and domestication research suggest traditional adoption models need modifications, refinements and extensions when applied to mobile Internet services.

In table 1, we have summarized some of the findings suggesting modifications and extensions of the concepts of the theory of planned behavior [47].

Table 1. Modifications and extensions of the theory of planned behavior

Concept / Research direction	Diffusion research	Uses and gratifications research	Domestication research
Ease of use	Complexity and trialability as determinants		Reversed influence of ease of use in young segments
Usefulness	Relative advantage, compatibility and observability as determinants	Gratifications of reassurance, availability, enjoyment and status/expressiveness extends the usefulness concept	Elements of expressiveness ("gift giving", "stage phoning") extends the usefulness concept
Attitude towards use		Gratifications of enjoyment and status/expressiveness influence attitudes	Interplay of utilitarian and social determination of attitudes
External influence	Attributes of diffusion network determines influence	Gratification of status most sought by light users -support the importance of external influence	Mobile service use as symbolic capital - theory of fashion suggests reduced influence in later stages
Interpersonal influence	Attributes of diffusion network determines influence	Gratification of sociability found in all studies of mobile service	Mobile services as social capital and mediating social networks
Subjective norm			Social and symbolic capital as determinants of subjective norm
Self efficacy	Segment differences in determinants		Self efficacy differences across age segments
Facilitating conditions	Network effects and critical mass part of facilitating conditions	Relevant facilitating conditions expected to differ with gratifications sought	Facilitating conditions perceived across work and leisure contexts
Behavioral control	Segment differences in determinants		Behavioral control differences across age segments

To give a few examples of the suggested modifications, findings in domestication research suggest an interaction of mobile services as symbolic capital and ease of use, so that mobile services that are easy to use represent reduced symbolic capital in young segments [46]. However, this interaction is not likely to be relevant in many other segments. A more important finding is that the traditional utilitarian conception of usefulness may have to be redefined when applied to mobile service adoption. Suggested additions are enjoyment and expressiveness as either determinants or elements of usefulness. From domestication studies based on "theory of fashion" [25] and uses and gratifications studies of status and expressiveness [22], it is obvious that attitudes towards use are not only influenced by usefulness and ease of use, but an interplay seems to exist between external influence, subjective norms and attitudes towards use of mobile services. Findings in all research directions suggest external and social influence should be included in any adoption model applied to mobile service adoption. However, some findings raise the issue of whether these influences are reduced at later stages of adoption or domestication. For example, Ling [25] assumes that the importance of external influence may be reduced with time. Social influence may also be reduced with time because as media is domesticated, social explanations loose their explanatory power because "*people generally agree about their use*" [53, p. 1549]. Finally, findings across research disciplines suggest that perceptions of self efficacy and relevant determinants of perceived facilitating conditions may vary considerably across user segments. In addition, situational and contextual explanations of adoption and media use are suggested in both CMC-research and domestication research, indicating that adoption models may differ across contexts of service use, such as work versus leisure use.

The suggestions summarized in table 1 should be treated as examples of how an adoption model may be modified and extended only. A more thorough review

of the literature may give better indications of which modifications and extensions are most relevant to the adoption models of particular user segments and mobile Internet service categories.

7. Conclusion and limitations

In this article we have briefly introduced four research directions in the study of mobile service adoption. We have shown how these research directions improve our understanding of the adoption mobile Internet services with their different perspectives of the object of adoption, levels of analysis, focus on the adoption process, and investigated contexts. However, few attempts have been made at integrating the findings into a more comprehensive model of mobile service adoption. In section 7, we suggested that such integration could be done modifying and extending a traditional adoption model based on the findings from diffusion, uses and gratifications and domestication research.

This article deliberately overlooks important research directions studying users of mobile services. For example, we have not included research focusing primarily on improving the usability of mobile services, or studies with the primary purpose of giving design advice to developers of mobile services. A third group of studies not mentioned here is domestication research studies mainly focusing on the societal consequences of mobile service usage. Usability and design oriented studies may improve our understanding the determinants of ease of use and studies of societal consequences may improve our understanding of how the adoption models change over time because external and interpersonal influence in society changes. As we have tried to show, however, existing studies directly investigating adoption includes findings of such a diversity and multitude that integrating these findings into an adoption model of mobile services is a rather challenging task in itself.

Even though general modifications and extensions were suggested here to the theory of planned behavior, many of the relevant findings indicate a need to develop different adoption model versions depending on the particular service or user segment being studied. For example, different versions of the model may be required when explaining the adoption of such different services as mobile entertainment services and mediating communication services. Similarly, different adoption model versions may be required when explaining the adoption of the same service by young and other end-users. As a step in this direction, we have recently developed versions of the technology acceptance model and the theory of planned behavior particularly oriented towards explaining the adoption of text messaging services, mobile payment services, mobile gaming services and mobile chat services. These models are currently under empirical investigation.

References

[1] J. Brodie and M. Perry, "Designing for mobility, collaboration and information use by blue-collar workers", presented at the ECSCW Workshop on Work/Place, Sep 18-20, Bonn, Germany, 2001.

[2] J. Carroll, S. Howard, F. Vetere, J. Peck and J. Murphy, "Just what do the youth of today want? Technology appropriation by young people", presented at the HICSS-35, Hawaii, US, Jan 7-10, 2002.

[3] R.L. Daft and R.H. Lengel, "Organizational information requirements, media richness and structural design", *Management Science*, vol. 32, pp. 554-57, 1986

[4] F.D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, vol. 13, pp. 319-340, 1989.

[5] J. Dimmick and J. Sikand, "The gratifications of the houshold telephone", *Communication Research*, vol. 21, pp. 643-664, 1994

[6] M. Fishbein and I. Ajzen, *Belief, attitude, intention and behavior: an introduction to theory and research*, Reading MA: Addison-Wesley, 1975.

[7] L. Fortunati, "The mobile phone: an identity on the move", *Personal and Ubiquitous Computing*, vol. 5, pp. 85-98, 2001.

[8] L. Fortunati, "The ambiguous image of the mobile phone", Cost 248 Report, Farsta: Telia, 1998.

[9] D. Gant and S. Kiesler, "Blurring and boundaries: cell phones, mobility and the line between work and personal life", in B. Brown, N. Green and R. Harper, Eds. *Wireless world: social and interactional aspects of the mobile age*, London: Springer, 2001, pp. 121-132.

[10] N. Green, R.H.R. Harper, G. Murtagh, and G. Cooper, "Configuring the mobile user: sociological and industry views", *Personal and Ubiquitous Computing*, vol. 5, pp. 146-156, 2001.

[11] H. Gruber and F. Verboven, "The evolution of markets under entry and standards regulation - The case of global mobile telecommunications", Working paper, Centre for Economic Policy Research, London, UK, 2000.

[12] C. Haythornthwaite, "Exploring multiplexity: Social network structures in a computer supported

distance learning class", *The Information Society*, vol. 17, pp. 211-226, 2001.
[13] P.J. Hu, P.Y.K. Chau, O.R. Lui Sheng, O.R. and K. Yan Tam, "Examining the technology acceptance model using physicians acceptance of telemedicine technology", *Journal of Management Information Systems*, vol. 16, pp. 91-112, 1999.
[14] M. Hume and S. Peters, "Me my phone and I: the role of the mobile phone", presented at the CHI 2001 Workshop on mobile communications, March 30- April 5, Seattle, WA, 2001.
[15] J.R. Höflich and P. Rössler, "Mobile schriftliche Kommunikation oder: E-Mail für das Handy", *Medien & Kommunikationswissenschaft*, vol. 49, pp. 437-461, 2001.
[16] M.E. Karlsen, I. Helgemo and M. Gripsrud, "Useful, cheap and fun: A survey of teenagers demands for mobile telephony", Research Report, Norway: Telenor R&D, 2001.
[17] Y.B. Kim, S.Y. Seo and Y. Lee, "A substitution and diffusion model with exogenous impact: Forecasting of IMT-2000 subscribers in Korea", presented at the IEEE VTC-99, May 16-20, Houston, TX, 1999.
[18] H.S. Kwon and L. Chidambaram, "A test of the technology acceptance model: the case of cellular telephone adoption, Presented at HICSS-34, Jan 3-6, Hawaii, US, 2000.
[19] R. LaRose, D. Mastro, and M.S. Easiton, "Understanding Internet usage: A social-cognitive approach to uses and gratifications", *Social Science Computer Review*, vol. 19, pp. 395-413, 2001.
[20] L. Leung, "College student motives for chatting on the ICQ", *New Media & Society*, vol. 3, pp. 483-500, 2001.
[21] L. Leung and R. Wei, "More than just talk on the move: Uses and gratifications of the cellular phone", *J&MC Quarterly*, vol. 77, pp. 308-320, 2000.
[22] L. Leung and R. Wei, "The gratifications of pager use: Sociability, information-seeking, entertainment, utility, and fashion and status" *Telematics and Informatics*, vol. 15, pp. 253-264, 1998.
[23] C.A. Lin, "Looking back: The contribution of Blumler and Katz's uses of mass communication to communication research*", Journal of Broadcasting & Electronic Media*, vol. 40, pp. 574-582, 1996.
[24] R. Ling, "We release them little by little: Maturation and gender identity as seen in the use of mobile telephony", *Personal and Ubiquitous Computing*, vol. 5, pp. 123-136, 2001.
[25] R. Ling, "It is 'in.' It doesn't matter if you need it or not, just that you have it: Fashion and the domestication of the mobile telephone among teens in Norway", Telenor Working Paper, Oslo, Norway: Telenor R&D, 2001.
[26] R. Ling, "Adolescent girls and young adult men: Two sub-cultures of the mobile telephone", presented at the InterMedia workshop on mobility, Nov 20, Oslo, Norway, 2001.
[27] R. Ling, "Direct and mediated interaction in the maintenance of social relationships", in A. Sloane and F. van Rijn (eds.), *Home informatics and telematics. Information technology and society*, Kluwer. Boston, 2000, pp. 61-86.
[28] R. Ling, "One can talk about common manners!": the use of mobile telephones in inappropriate situations", in L. Haddon (ed), *Themes in mobile telephony*. Cost 248 Report, Telia, Farsta, Sweden, 1997.
[29] R. Ling and L. Haddon, "Mobile telephony, mobility and the coordination of everyday life", presented at the "Machines that become us" conference, April 18-19, Rutgers University, NJ, 2001.
[30] R. Ling and B. Yttri, "Nobody Sits at Home and Waits for the Telephone to Ring: Micro and Hyper-Coordination Through the Use of the Mobile Telephone", in J. Katz and M. Aakhus (eds.), *Perpetual Contact*, Cambridge University Press, Cambridge, 2002.
[31] V. Mahajan, E. Muller and F.M. Bass, "New product diffusion models in marketing: A review and directions for research", *Journal of Marketing*, vol. 54, pp. 1-27, 1990.
[32] A. Mahler and E.M. Rogers, "The diffusion of interactive telecommunication innovations and the critical mass: the adoption of telecommunication services by German banks", *Telecommunications Policy*, vol. 23, pp. 719-740, 2000.
[33] E. Mante-Meyer and L. Haddon, (eds.) *Checking it out with the people – ICT markets and users in Europe.* Eurescom Project Report, Eurescom project P-903, Eurescom, Germany, 2001.
[34] B. Nardi, S. Whittaker and E. Bradner, *"Interaction and outeraction: Instant messaging in action*", presented at CSCW-00, Dec 2-6, Philladelphia, PA, 2000.
[35] O'Hara, .K., Perry, M., Sellen, A.J. and Brown, B. A. T. (2001) Exploring the relationship between mobile phone and document use during business travel. In Brown, B., Green, N., Harper, R. (Eds) *Wireless World: social and interactional implications of wireless technology*. Springer Verlag.
[36] V. Oksman and P. Raitiainen, "Perhaps it is a body part. How the mobile phone became an organic part of the everyday lifes of children and teenagers", 15. presented at the Nordiska konferensen för medie- ock

kommunikationsforskning, Island, August, 11-13, 2001.
[37] W.J. Orlikowski and C.S. Iacono, "Research Commentary: Desperately seeking the "IT" in IT research - A call to theorizing the IT artifact", *Information Systems Research*, vol. 12, pp. 121-134, 2001.
[38 L. Palen, M. Salzman and E. Youngs, "Discovery and integration of mobile communications in everyday life", *Personal and Ubiquitous Computing*, vol. 5, pp. 109-122, 2001.
[39] P.E. Pedersen, "Adoption of mobile Internet services: An exploratory study of mobile commerce early adopters", *Journal of Organizational Computing and Electronic Commerce,* forthcoming.
[40] S. Plant, *On the mobile. The effects of mobile telephones on social and individual life*, Research Report, Motorola, US, 2001.
[41] L.F. Rakow and V. Navarro, "Remote mothering and the parallel shift: Women meet the cellular telephone", *Critical studies in mass communication*, vol. 10, pp. 144-157, 1993.
[42] E.M. Rogers, *Diffusion of Innovations,* (4. ed.), New York: The Free Press, 1995.
[43] R. Silverstone and L. Haddon, "Design and the Domestication of Information and Communication Technologies: Technical Change and Everyday Life", in R. Silverstone, and R. Mansell (eds), *Communication by Design. The Politics of Information and Communication Technologies*, Oxford University Press, Oxford, 1996.
[44] B. Skog, " Mobiles and the Norwegian teen: identity, gender and class," in *Perpetual Contact,* J.E. Katz and M. Aakhus, Eds. New York: Cambridge University Press, 2002.
[45] A.S. Taylor and R.H.R. Harper, "The gift of the gab?: a design oriented sociology of young people's use of 'mobilZe!", Working Paper, Digital World Research Centre, University of Surrey, UK, 2001.
[46] A.S. Taylor and R.H.R. Harper, "Talking activity: young people and mobile phones", presented at the CHI 2001 Workshop on mobile communications, Seattle, April 1-5, 2001.
[47] S. Taylor and P.A. Todd, "Understanding information technology usage: a test of competing models", *Information Systems Research*, vol. 6, pp. 144-176, 1995
[48] D. Te'eni, "A cognitive-affective model of organizational communication for designing IT", *MIS Quarterly*,vol. 25, pp. 251-312, 2001.
[49] I. Tjøstheim and K. Boge, "Mobile commerce – who are the potential customers?", presented at COTIM-2001, July 18 - 20, Karlsruhe, Germany, 2001.
[50] A.M. Townsend, "Life in the real – mobile telephones and urban metabolism", *Journal of Urban Technology*, vol. 7, pp. 85-104, 2000.
[51] L.K. Trevino, J. Webster and E.W. Stein, "Making connections: Complementary influences on communication media choices, attitudes and use", *Organization Science*, vol. 11, pp. 163-182, 2000.
[52] R. Wei, "From luxury to utility: A longitudinal analysis of cell phone laggards", *J&MC Quarterly*, vol. 78, pp. 702-719, 2001.
[53] J. Webster and L.K. Trevino, "Rational and social theories as complementary explanations of communication media choices: Two policy-capturing studies", *Academy of Management Journal*, vol. 38, pp. 1544-1572, 1995.
[54] A. Weilenmann and C. Larsson, "On doing 'Being Teenager'. Applying ethnomethodology to the analysis of young people's use of mobile phones", presented at the IRIS 23*,* University of Trollhättan, Uddevalla, August 13-15, 2000
[55] B. Wellman, "Physical place and cyberplace: the rise of personalized networking", *International Journal of Urban and Regional Research*, vol. 25, pp. 227-252, 2001.